2A95-40

REVIEW OF THE 1995 LOWER COOK INLET AREA COMMERCIAL HERRING FISHERY

REPORT TO THE ALASKA BOARD OF FISHERIES

by

Wesley A. Bucher
and
Lee F. Hammarstrom

Regional Information Report[1] 2A95-40

Alaska Department of Fish and Game
Commercial Fisheries Management & Development Division
Central Region
333 Raspberry Road
Anchorage, Alaska 99518-1599

November, 1995

---

[1] Contribution from the Homer area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Commercial herring fishing occurs in four of the five districts in Lower Cook Inlet (Figures 1 and 2). Herring fishing began in the Southern District in 1914 as a gillnet fishery within Kachemak Bay (Figure 2). Eight saltries, six near Halibut Cove, were operating during the peak of the fishery. Fishing with purse seines began in 1923, and after three subsequent years of average annual harvests approaching 8,000 short tons (st), herring populations, and the fishery, collapsed.

The next Lower Cook Inlet herring fishery began in 1939 and was centered in the Resurrection Bay and Day Harbor area of the Eastern District (Figure 2). This was a purse seine fishery with the product used exclusively for oil and meal reduction. Peak harvests occurred from 1944-46 averaging 16,000 st each year, and stocks sharply declined thereafter, apparently due to over-exploitation.

Japanese markets for a salted herring roe product resulted in development of a sac roe fishery in the 1960's. Market demand and the relatively high prices paid to fishermen caused rapid expansion of the fishing fleet and harvest. Although Department management and research efforts lagged behind the rapid growth of the fishery, conservative management strategies and guideline harvest levels were established in response to historical over-exploitation of these fisheries.

1995 SEASON OVERVIEW

A total of 3,378 short tons (st) of Pacific herring was landed in the Kamishak Bay District during 1995 (Figure 1, Tables 1-3). The herring sac roe harvest was about 36% higher than the 1994 harvest of 2,152 st but only about half the record high catch of 6,132 tons set in 1987 (Table 3). Of the 75 Lower Cook Inlet permit holders, 60 made at least one landing in 1995. A total of 12 processors purchased herring this season and final (processed) roe recoveries averaged 9.8% for

the sac roe harvest. Estimated exvessel value of the 1995 harvest will exceed $4 million without any postseason adjustments (Table 2).

The total herring spawning biomass in the Kamishak Bay District, estimated from aerial surveys and post-season age composition analysis, was 21,753 st. Age composition, heavily dominated by the age-7 component (59%), was similar to the preseason forecast.

No sac roe herring fishery occurred in the Southern District (Figure 2) in 1995 as fish were never present in sufficient quantity to allow a harvest. The Outer and Eastern Districts (Figure 2) were not opened to purse seining this season due to past years' predominance of young (age 3 and 4) fish, roe recoveries consistently below 10%, and the general lack of interest by fishermen and processors in this area.

MANAGEMENT SUMMARY - 1995 SEASON

Assessment Methods

Aerial surveys were conducted throughout the herring spawning season to determine relative abundance and distribution of herring in the Kamishak Bay and Southern Districts. Data collection methods were consistent with those used in previous seasons. Numbers and distribution of herring schools, location and extent of milt, and visibility factors affecting survey results were recorded on index maps for each survey. Standard conversion factors of 1.52 st (water depths of 16 ft or less), 2.56 st (water depths between 16 and 26 ft) and 2.83 st (water depths greater than 26 ft) per 538 sq. ft were used to convert estimated herring school surface areas to biomass.

Survey conditions in the Kamishak Bay District were generally fair throughout the early part of the season, with relatively few days hampered by low cloud ceilings, fog, or high winds. However, poor weather in May after the fishery precluded surveys of the district for lengthy periods. Only 11 surveys were completed in the Kamishak Bay District, and eight in the

Southern District. No comprehensive surveys of the Outer and Eastern Districts were conducted this season.

In the Kamishak District, commercial landings were sampled to determine age, size, and sexual maturity of herring. In addition, test fishing by volunteer purse seine vessels was conducted to collect samples for roe recovery analysis prior to the fishery. Test fishing data was also used in post-season analysis to interpret aerial survey biomass data.

SPAWNING POPULATION

Kamishak Bay District

During the 1995 season aerial surveys to estimate biomass in the Kamishak Bay District were conducted from April 17 through June 2; herring were first observed April 20. The highest daily biomass observations were made on May 1 (2,163 st), and June 2 (1,492 st). Post-season data analysis from aerial surveys, test fishing, and commercial harvests resulted in a total spawning biomass estimate of 21,753 st (Table 2). This was considered a minimal estimate since an additional (undocumented) quantity of herring was known to be present during the month of May when aerial surveys were hampered by poor weather.

Nearly 20% of the total biomass (by weight) was composed of ages 9-14 herring. Ages 7-8 accounted for 70%, ages 5-6 herring 9.4%, while newly recruited ages 3 and 4 herring only represented .85% of the total spawning population (Figure 4).

Only limited spawning was observed this season with most observations recorded between April 27 - May 1. The few sightings were all relatively small in size. The heaviest spawning was observed in Amakdedulia Cove on April 28 when an estimated 3.0 linear miles were recorded.

Southern District

Aerial surveys of the Southern District were conducted between May 2 and May 25, resulting in a cumulative biomass estimate of 3,633 st. The majority of the herring was observed in Mallard Bay and Bear Cove, with the peak biomass estimates of 641 st on May 5 and 602 st on May 12 for the two areas, respectively. Only limited age composition samples were collected from the Southern District in 1995. Herring taken from two separate sets in Mallard Bay on May 12 were dominated by age-5 fish. Peak abundance throughout the district occurred on May 5 when 1,375 st were observed.

Outer and Eastern Districts

No aerial surveys of the Outer and Eastern Districts were conducted during the 1995 season. The size of the area and the characteristically poor weather in the Gulf of Alaska, which precludes surveys on a regular basis, makes aerial biomass estimation in these two districts impractical. However, incidental observations of herring in June during the early part of the salmon season confirmed the presence of herring in these two districts again this season.

COMMERCIAL FISHERY

NOTE: Proposal #68 seeks to amend the maximum length of purse seines used in the Lower Cook Inlet herring fishery to 100 fathoms.

Kamishak Bay District

Kamishak Bay was re-opened to commercial herring fishing in 1985 after a five-year closure beginning in 1980 due to a severe decline in abundance. The herring stocks appeared to rebound quickly in response to the closure, and since 1985, the Kamishak Bay District has been regulated to achieve a 10-20% exploitation rate mandated by the Board of Fisheries. By 1989, fishing efficiency had evolved to a level where intensive regulatory management was required to ensure

maximum value of the harvest and maintain the guideline harvest level while protecting younger age fish. Management strategy during the last six years has stabilized the harvest at approximately one-third the record high catch of 6,132 tons set in 1987 (Table 2). Although management prior to 1990 allowed this fishery to be open on a specific calendar date, since that time, industry technicians have been asked to evaluate test fish samples for roe recovery prior to commercial harvests to help maximize product quality and value.

The 1995 spawning biomass in the Kamishak Bay District was projected to be 21,998 tons. Based on the projected return, a surplus of approximately 3,300 tons was available for harvest using a 15% exploitation rate. Harvest allocation in accordance with the management plan allowed 2,970 tons to be taken by the Kamishak Bay sac roe fishery after subtracting 330 tons for the Shelikof Strait food and bait fishery. The 15% harvest rate was dictated by the Kamishak Bay Herring Management Plan, which targets the harvest on older age classes and limits the harvest of younger fish.

Volunteer test fishing boats produced the first samples of the season on April 23 near Chenik Head. However, the catch was comprised of small immature herring. Additional samples were collected the following day, and once again proved to be small (age-2) fish. On April 25, older fish in spawning condition were captured in two separate sets near Nordyke Island. Roe recovery samples from those those fish averaged 8.7% with a relatively high proportion of males. Test fishing continued throughout the following two days before roe recoveries improved to an acceptable level. During that time, aerial surveys documented concentrations of fish in Amakdedulia Cove, between Nordyke Island and the mainland, and along the Douglas Reef, and the first spawn sighting of the season was recorded near the mouth of Bruin Bay.

On April 27, the staff concluded that further delay of the fishery could result in reduced roe recoveries due to the influx of younger (immature) fish and/or an increase in the number of spawn-outs. Since the management strategy attempts to minimize the harvest of younger age fish, and given the favorable weather conditions at the time, the decision was made to allow a 30-minute fishing period in Management Area 5 at 12:30 p.m.

As the opening began, the entire fleet converged into a small area just outside of McNeil Cove where the fishery took place. Approximately 30 commercial spotter aircraft were present during the opening. Weather and water conditions were favorable for aerial observation and much of the seining was done with the aid of spotter airplanes. Preliminary catch reports from one-half hour of fishing totalled approximately 1,500 tons. Of the 75 fishing vessels on the grounds, 45 boats actually made deliveries. Although only about half of the preseason guideline harvest level was taken, no extension of the fishing period was allowed that evening and the fleet was advised to stand down until 9:00 a.m. the following morning.

On April 28,with approximately 1,400 tons of the harvestable surplus remaining, commercial spotter pilots reported fish concentrations continuing to build near Chenik Head, inside Amakdedulia Cove, and along the Douglas Reef. Based on those reports and fishermen's accounts of hydroacoustic observations of fish concentrations in McNeil Cove and Amakdedulia Cove, another (60-minute) opening was announced commencing between 11:55 p.m. and 12:05 p.m. The second opening produced an additional 1,450 tons. As catch estimates were refined, the cumulative harvest from both openings totalled 3,125 tons with an average roe recovery of 10.1% mature roe, slightly exceeding the preseason guideline harvest level and effectively closing the Kamishak Bay District for the season.

The two fishing periods on April 27 and 28 equated to a total fishing time of 1.5 hours, with the final catch from fish ticket data amounting to 3,378 st. The harvest exceeded the preseason guideline by 400 st and slightly exceeded the 1985-94 average catch (3,184 st) for Kamishak Bay District (Table 1).

Preliminary value of the Kamishak Bay District herring harvest to fishermen was estimated at $4,044,000 (Table 2). Sac roe prices were estimated at $1,300 per short ton for 10% roe, plus or minus $130 for each 1.0% change. The estimated average roe recovery of 9.8% for the sac roe harvest yielded an exvessel price of $1,196 per short ton without accounting for any post-season

adjustments. Most companies paid an "on-grounds" base price with additional post-season settlements to be paid after price finalization with the foreign market.

By Board of Fisheries directive, the Kamishak Bay District herring fishery is managed with the intent of harvesting 10-20% of the available biomass. This year, the overall exploitation was 13.4% of the estimated spawning biomass, based on a total harvest of 3,378 st and a total biomass estimate of 25,131 st.

Southern District

Management strategy for the Southern District sac roe fishery was changed in 1989 to allow for a limited harvest of 150-200 st for the purposes of obtaining age, weight, length and roe recovery information. Sac roe herring had not been fished in the Southern District since 1979 when poor stock conditions forced an area-wide closure. Only one fishery has occurred since that time, when 171 st of 8.9 percent herring were harvested by 10 vessels in one 2.5-hour opening in Mallard Bay during 1989 (Table 1).

This past season, aerial surveys of the Southern District conducted between May 2 and May 25 resulted in a cumulative biomass estimate of 3,633 st. A commercial herring harvest was not allowed in the Southern District in 1995 because herring abundance was deemed insufficient to warrant an opening.

Outer and Eastern Districts

NOTE: Proposals #66 and #67 seek to amend the herring fishing season and the guideline harvest levels and allow commercial harvest of herring for bait in the Outer and Eastern Districts.

During the early years of sac roe herring fishing in Lower Cook Inlet, seining within the Outer and Eastern Districts primarily occurred in Resurrection Bay. Following a period of suspected

overexploitation, herring stocks throughout Lower Cook Inlet generally declined after 1973. Concern over this decline prompted the Board of Fish and Game in 1974 to establish a 4,000-ton quota for all of Lower Cook Inlet with the Outer and Eastern Districts each allocated 1,000 st. The quotas were never utilized since stock abundance continued to decline, and the Outer and Eastern Districts were closed to fishing from 1975-1984.

In 1985, the sac roe fishery was allowed to resume in the Outer and Eastern Districts on a very conservative basis, even though no noticeable change in spawning biomass had been observed. Because of reduced stock abundance and extreme vulnerability to fishing, guideline harvest levels were set at 150-200 st for each of the four management areas created within these two districts (Figure 2). Fishing effort in 1985 was minimal and the bulk of the harvest (216 st) once again occurred in Resurrection Bay (Table 1).

Only limited and sporadic harvests have occurred in these two districts since 1985, and the majority of the herring harvest and the observed biomass since that time has been comprised of ages 3-4 fish. Unlike the Southern and Kamishak Bay Districts, samples from the Outer and Eastern Districts have contained up to 14% age-2 (sexually immature) herring. Although sampling has been limited, no discernable shift to older age herring has ever been observed, suggesting the possibility that the Outer and Eastern Districts may be feeding and rearing grounds for juvenile fish of Prince William Sound origin.

In 1991 the two districts were opened to purse seining for a six-hour period each day for three weeks; effort amounted to four boats and one spotter aircraft. In 1992 the areas were again opened to fishing on a similar schedule, but only one boat and spotter expressed interest and put forth a very limited effort. The Outer and Eastern Districts have not been opened to fishing during the past three seasons. Despite opportunities for exploratory fishing, the predominance of juvenile herring in the population, and the marginally acceptable roe recoveries from fish caught in these areas, has contributed to a lack of interest by fishermen and processors.

OUTLOOK AND MANAGEMENT STRATEGY FOR 1996

The 1996 spawning biomass of herring in Kamishak Bay District is projected to be 20,925 st or approximately 17% lower than the 1995 estimated biomass (Figure 3, Table 3). An age-structured analysis (ASA) model utilizing a schedule of increasing natural mortality with age was used to project the 1996 return. Approximately 81% of the biomass is expected be eight years or older. The 1987 and 1988 year classes will continue to dominate the population representing 68% of the biomass by weight (Figure 4). Given the forecasted age composition, the average weight of the fish would equal 223 g.

Although stocks generally have appeared healthy, limited data now indicates a decrease in Kamishak herring abundance due to a lack of recruitment of younger (age 3-4) fish into the population. It is thought that this may be a function of inadequate sampling rather than a real decline in productivity. Additional (postseason) sampling during the latter migratory period in May is planned in an effort to answer this question and more accurately predict recruitment.

Although the management plan allows for a maximum harvest rate of 15%, a 12% exploitation rate was used to set the guideline harvest level for the 1996 season. The conservative harvest rate was selected because of concern regarding the low abundance of recruit age herring during 1994 and 1995.

Based on the forecasted biomass of 20,925 st, a surplus of approximately 2,500 st would be available for harvest at the 12% exploitation rate. Harvest allocation in accordance with the management plan would be as follows:

		Tons
TOTAL ALLOWABLE HARVEST	(12%)	2,500
SHELIKOF STRAITS FOOD & BAIT	(1.2%)	250
KAMISHAK BAY SAC ROE HARVEST	(9%)	2,250

Table 1. Commercial catch of Pacific herring by district, in short tons, Lower Cook Inlet, 1975-1995.

Year	Southern	Kamishak	Eastern	Outer	Total
1975	24	4,119	-	-	4,143
1976	0	4,842	-	-	4,842
1977	291	2,908	-	-	3,199
1978	17	402	-	-	419
1979	13	415	-	-	428
1980	-	-	-	-	-
1981	-	-	-	-	-
1982	-	-	-	-	-
1983	-	-	-	-	-
1984	-	-	-	-	-
1985		1,132	204	12	1,348
1986	-	1,959	167	28	2,154
1987	-	6,132	584	202	6,918
1988	-	5,548	0	57	5,605
1989	170	4,801	0	0	4,971
1990	-	2,264	-	-	2,264
1991		1,992	-	-	1,992
1992	-	2,282	-	-	2,282
1993	-	3,570	-	-	3,570
1994	-	2,167	-	-	2,167
1995	-	3,378	-	-	3,378
Average					
1975-1994	86	2,969	136	35	3,083
1975-1984	69	2,537	-	-	2,606
1985-1994	170	3,185	136	35	3,321

Table 2. Estimated herring biomass and commercial purse seine catch of herring in short tons, exploitation rates, average roe recovery, number of permits fished, and exvessel value in millions of dollars, Kamishak Bay District, Lower Cook Inlet, 1978-1995.

Year	Spawning Biomass[a]	Commercial Catch	Total Biomass	Percent Exploitation	Average Roe %	No. of Permits	Exvessel Value[b]
1978	800	402	1,202	33.4	-	44	[c]
1979	2,900	415	3,315	12.5	-	[c]	[c]
1980	-	0	-	-	-	-	-
1981	5,130	0	5,130	-	-	-	-
1982	4,835	0	4,835	-	-	-	-
1983	4,750	0	4,750	-	-	-	-
1984	2,885[d]	0	6,500	-	-	-	-
1985	12,188	1,132	13,320	8.5	11.3	23	1.0
1986	24,042	1,959	26,001	7.5	10.4	54	2.2
1987	29,200	6,132	35,332	17.4	11.3	63	8.4
1988	24,000	5,548	29,548	18.8	11.1	75	9.3
1989	30,900	4,801	35,701	13.5	9.5	75	3.5[e]
1990	17,400	2,264	19,650	11.5	10.8	75	1.8
1991	16,171[f]	1,992	18,163[f]	11.0	11.3	58	1.3
1992	21,795	2,282	24,077	9.5	9.7	56	1.4
1993	28,869	3,570	32,439	11.0	10.2	60	2.2
1994	23,177	2,167	25,344	8.5	10.6	61	1.5
1995	21,753	3,378	25,131	13.4	9.8	60	4.0
1978-94 Avg.[g]	13,477	1,896	15,650	12.1	10.8	58	3.9

[a] Spawning biomass estimates are minimal estimates based on aerial surveys.
[b] Exvessel values exclude any postseason retroactive adjustments.
[c] Data not available.
[d] Spawning had already begun on first survey. Total spawning biomass estimate was higher than the peak survey estimate of 2,885 tons.
[e] Includes retroactive adjustment.
[f] Due to poor aerial survey conditions, 1991 biomass was calculated from the preseason estimate of abundance, adjusted to match observed age composition samples in the 1991 catch.
[g] Average excludes 1980 when no data was available.

Table 3. Total biomass estimate and commercial catch of Pacific herring in short tons by age class, Kamishak Bay District, Lower Cook Inlet, 1995, and 1996 forecast.

Age	1995 Estimated Biomass	1995 Commercial Harvest	Percent by Weight	1996 Forecast Biomass	Percent by Weight
1					
2					
3	26	4.1	0.1	1,145	5.5
4	159	24.7	0.7	67	0.3
5	822	127.7	3.8	278	1.3
6	1,229	190.8	5.7	1,153	5.5
7	12,758	1,980.9	58.7	1,348	6.4
8	2,436	378.3	11.2	12,327	58.9
9	833	129.4	3.8	1,891	9.0
10	661	102.7	3.0	538	2.6
11	2,036	316.1	9.4	364	1.7
12	731	113.5	3.4	1,295	6.2
13(+)	59	9.1	0.3	519	2.5
TOTAL	21,753	3,377.5	100.0	20,925	100.0

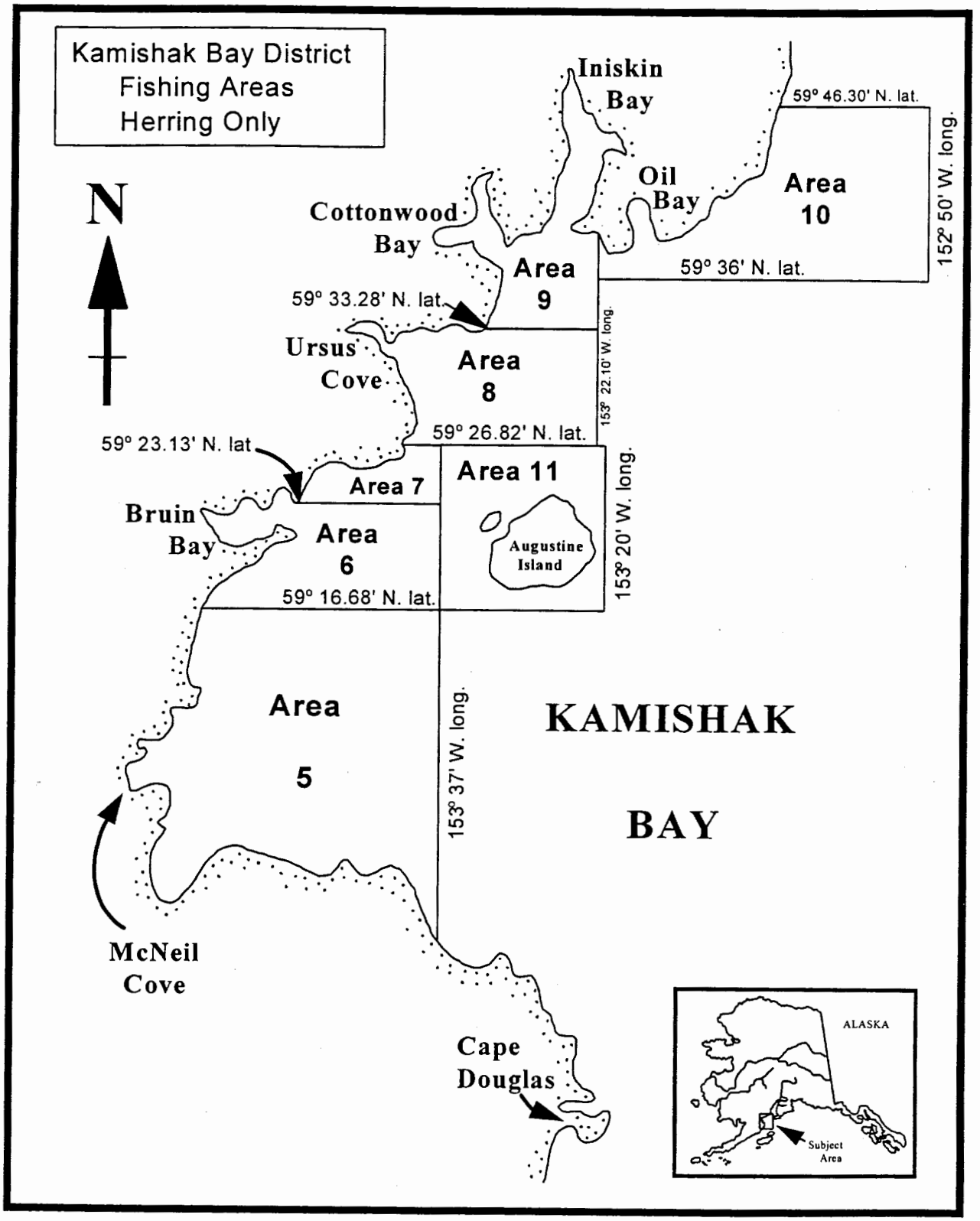

Figure 1. Commercial herring fishing areas, Kamishak Bay District, Lower Cook Inlet.

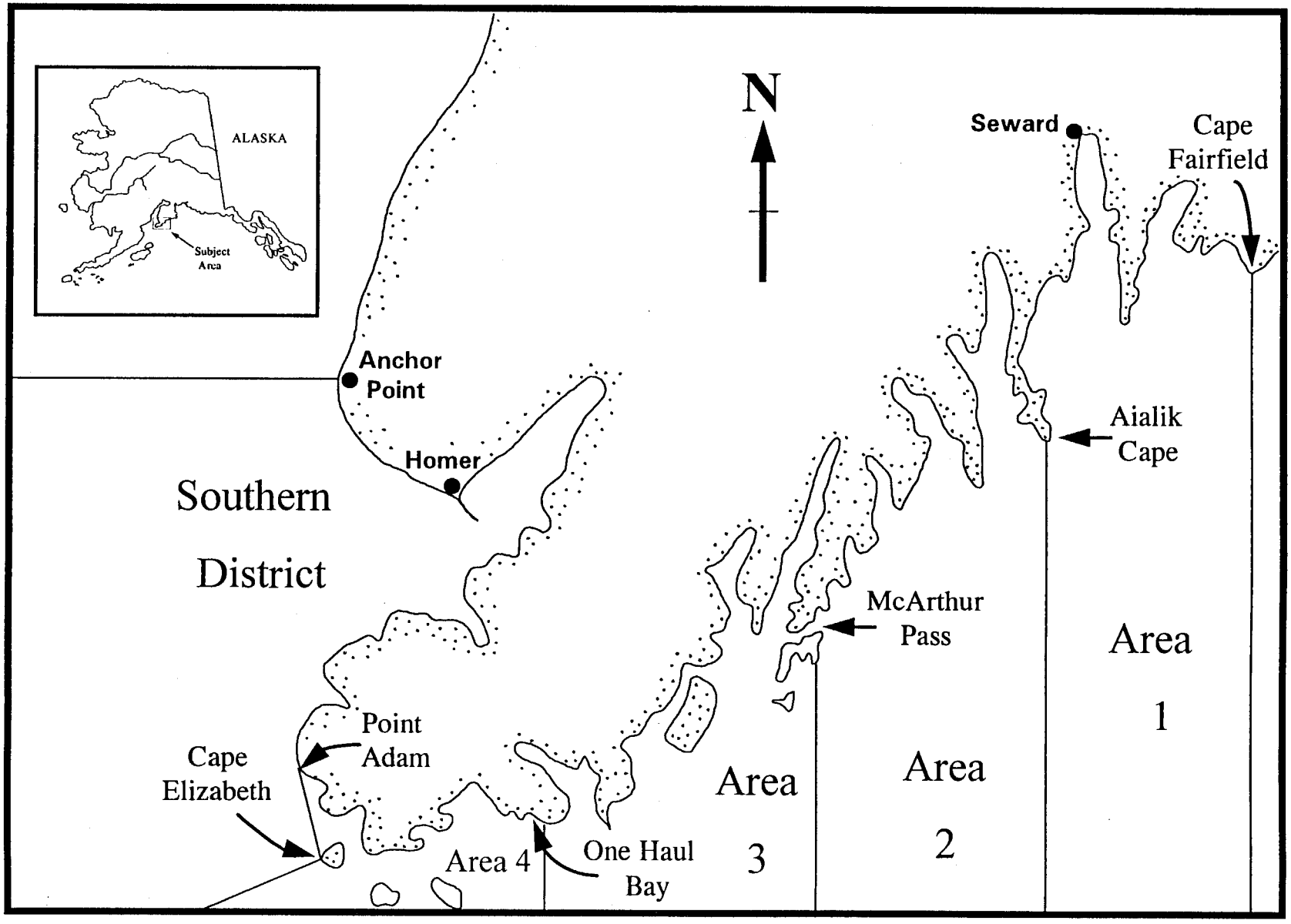

Figure 2. Commercial herring fishing areas, Outer, Eastern, and Southern Districts, Lower Cook Inlet.

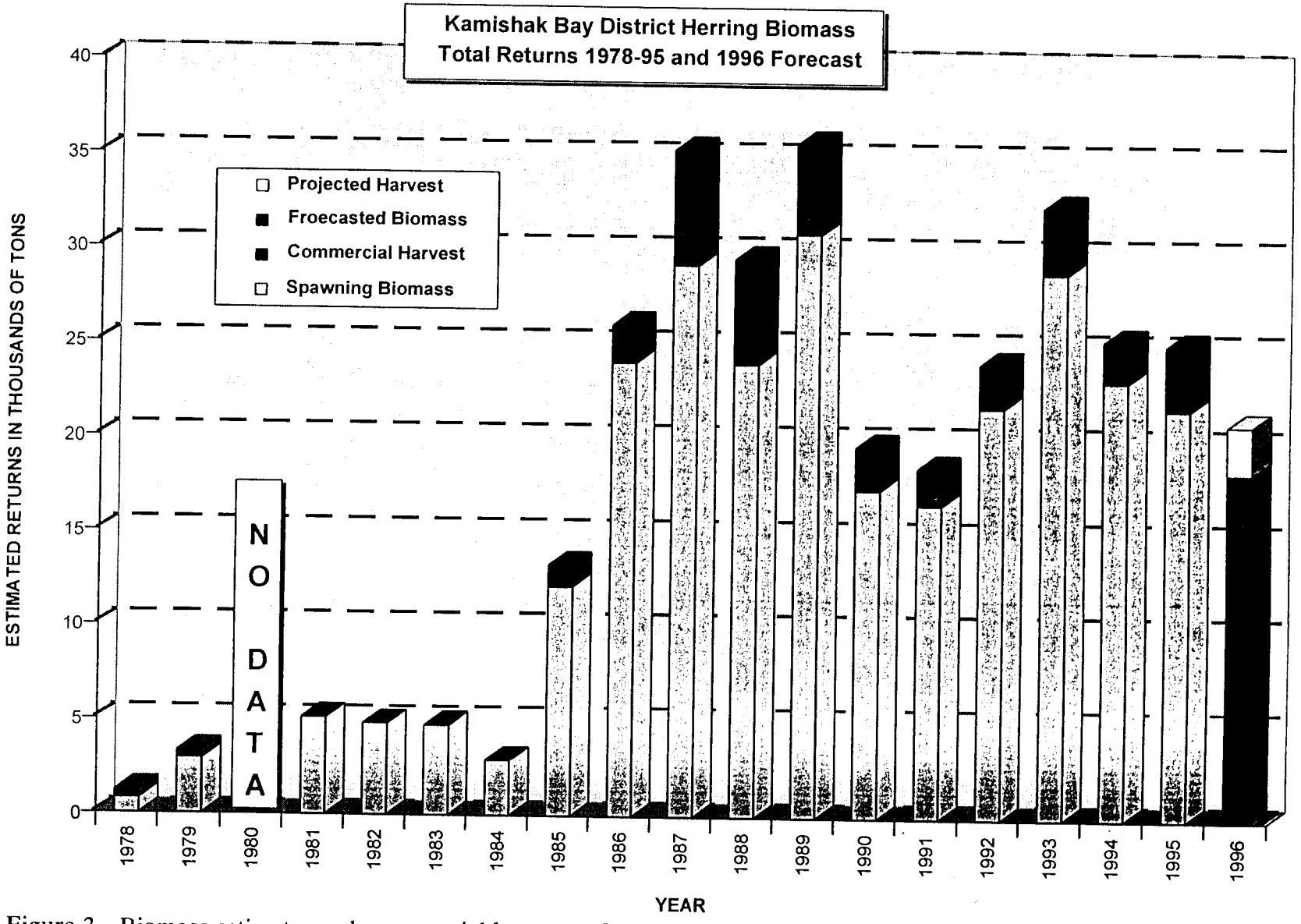

Figure 3. Biomass estimates and commercial harvests of Pacific herring in the sac roe seine fishery, Kamishak Bay District, Lower Cook Inlet, 1978 - 1995, and 1996 projection.

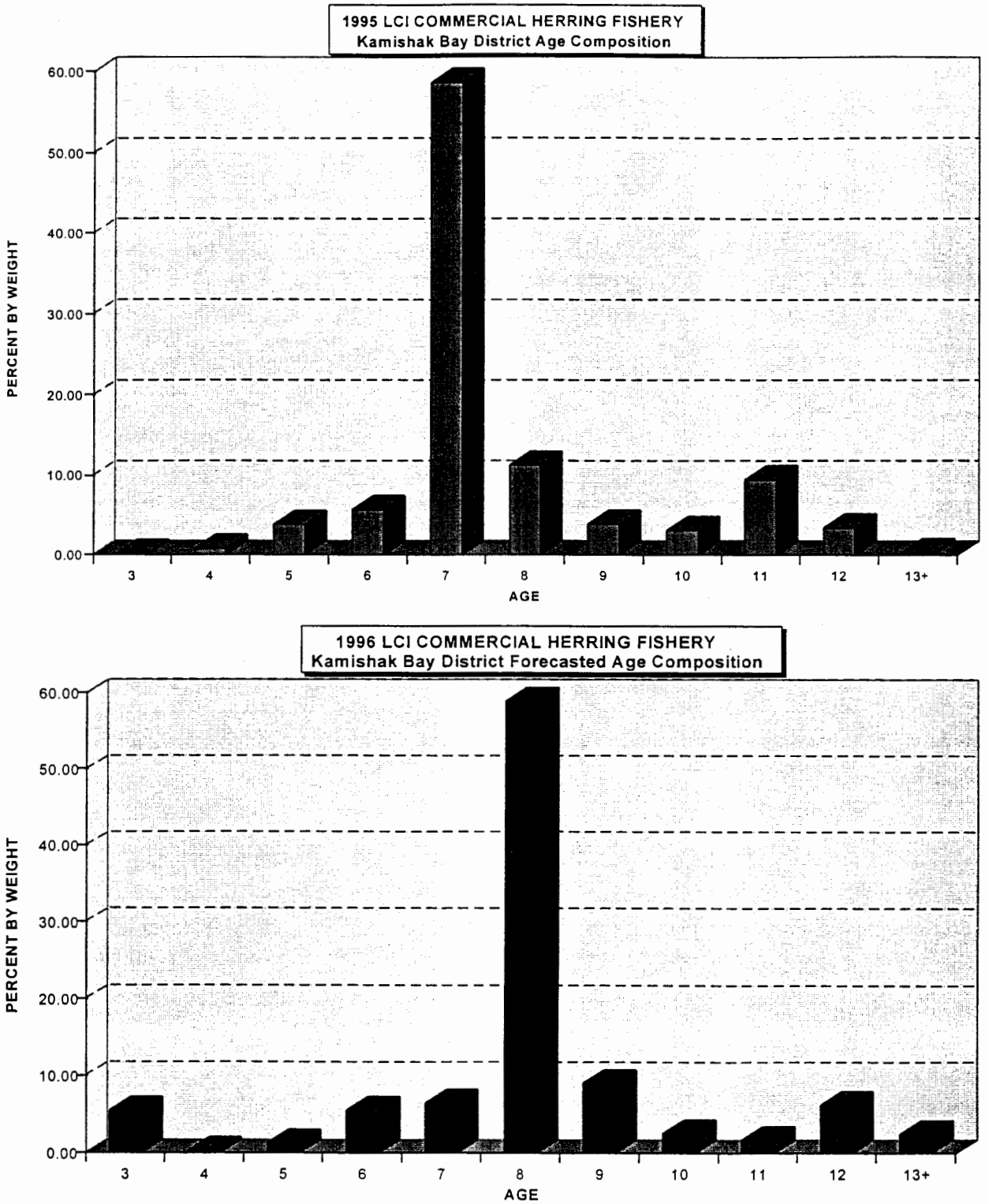

Figure 4. Observed age composition of the Pacific herring commercial sac roe harvest, Kamishak Bay District, Lower Cook Inlet, 1995, and the 1996 predicted age composition.

The Alaska Department of Fish and Game conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648 or (FAX) 907-586-6596. Any person who believes he or she has been discriminated against should write to: ADF&G, P.O. Box 25526, Juneau, Ak. 99802-5526; or O.E.O., U.S. Department of the Interior, Washington, D.C. 20240.